

## 25224 - Water pollution

### Syllabus Information

**Academic Year:** 2019/20

**Subject:** 25224 - Water pollution

**Faculty / School:** 201 -

**Degree:** 277 - Degree in Environmental Sciences

571 - Degree in Environmental Sciences

**ECTS:** 6.0

**Year:** 571 - Degree in Environmental Sciences: 3

277 - Degree in Environmental Sciences: 3

**Semester:** First Four-month period

**Subject Type:** Compulsory

**Module:** ---

### 1.General information

#### 1.1.Aims of the course

#### 1.2.Context and importance of this course in the degree

#### 1.3.Recommendations to take this course

### 2.Learning goals

#### 2.1.Competences

#### 2.2.Learning goals

#### 2.3.Importance of learning goals

### 3.Assessment (1st and 2nd call)

#### 3.1.Assessment tasks (description of tasks, marking system and assessment criteria)

### 4.Methodology, learning tasks, syllabus and resources

#### 4.1.Methodological overview

The methodology followed in this course is oriented towards the achievement of the learning objectives. Students will work with environmental pollution so they can acquire the habits and skills necessary for planning and develop a strategy to control water pollution from a technical point of view. A wide range of teaching and learning tasks are implemented, such as lectures, practice sessions, seminars, fieldwork, autonomous work and study.

#### 4.2.Learning tasks

This course is organized as follows:

- **Lectures** (30 hours)
- **Practice sessions** (20 hours). Laboratory and a Comprehensive Practical Assignment.
- **Seminars** (5 hours)
- **Fieldwork** (5 hours). Visits to water treatment facilities

- **Autonomous work and study** (86 hours)

### 4.3.Syllabus

This course will address the following topics:

#### Lectures

##### Section 1. Introduction to the quality and pollution of water

- Topic 1. General concepts about the quality and pollution of water.
- Topic 2. Water pollutants. Types of pollutants. Origin and effects of the pollutants. Main polluting sectors. Characterizing the pollution present in sewage and natural water. Physicochemical parameters and biological indicators.
- Topic 3. Evolution of pollutants in the receiving environment
- Topic 4. Basic legislation regarding water. Quality standards.

##### Section 2. Water treatment technology

- Topic 1. General concept about water treatment technologies. Classification of treatments. Water treatment installations: treatment, purification, regeneration.
- Topic 2. Homogeneization chambers
- Topic 3. Techniques for the elimination of thick solids, sedimentable solids and fats. Roughing down and removal of sand and grease.
- Topic 4. Techniques for the elimination of suspended or colloidal. Matter. Coagulation, flocculation, decanting, flotation and filtration.
- Topic 5. Techniques for eliminating biodegradable matter. Biological treatments, dispersed phase and fixed phase.
- Topic 6. Techniques for the elimination of sludge.
- Topic 7. Techniques for the elimination of non-biodegradable matter. Eliminating dangerous substances: neutralization, adsorption, oxidation, reduction, stripping.
- Topic 8. Water treatment for water with resin and membrane process: Osmosis, Nanofiltration, Ultrafiltration, Microfiltration, Electrodialysis.
- Topic 9. Disinfection treatments: chlorination, ozonization, UV light.
- Topic 10. Low-cost technologies.

#### Practice sessions

- P1. Characterization of waste and treated waters through indicator parameters.
- P2. Monitoring of Practical Integral Work
- P3. Drinking water production (with natural water).
- P4. Assessment of the organic contamination of domestic wastewater: determination of the COD, BOD and TOC.
- P5. Waste treatment in a chrome industry: elimination of chrome using coagulation/flocculation.
- P6. Elimination of contaminants in water using advanced oxidation processes
- P7: Presentation of the Comprehensive Practical Project.

### 4.4.Course planning and calendar

Schedule sessions and presentation of assignments

Activity/Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
<i>Class activity</i>																
Lectures	2	2	2	2	2	2	2	2	2	2	2	2	1	2		
Seminars								3					2			
Lab sessions			3		3	3	3		3							
Simulation sessions				2										3		

visits

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Evaluation

*Autonomous work  
and study*

Individual work	4	4	3	4	2	2	2	2	2	4	4	1	3	2	6	6
Collective work					1	1	1	1	1	2	2		2	1		
TOTAL	6	6	8	8	8	8	8	8	8	8	8	8	8	8	6	6

Further information concerning the timetable, classroom, office hours, assessment dates and other details regarding this course will be provided on the first day of class or please refer to the Faculty of Sciences website and Moodle.

#### 4.5. Bibliography and recommended resources

- BB** Calidad y tratamiento del agua : manual de suministros de agua comunitaria / American Water Works Association Madrid [etc.] : McGraw Hill, D.L. 2002
- BB** Ingeniería de aguas residuales : tratamiento, vertido y reutilización / Metcalf and Eddy ; revisado por George Tchobanoglous, Franklin L. Burton ; traducción y revisión técnica, Juan de Dios Trillo Montsoriu, Ian Trillo Fox ; prólogo de Angel Cajigas . - 3a. ed., [reimpr.] Madrid [etc.] : McGraw-Hill, D.L. 2000
- BB** Nemerow, Nelson Leonard. Tratamiento de vertidos industriales y peligrosos / Nelson Leonard Nemerow, Avijit Dasgupta Madrid : Diaz de Santos, D.L. 1998
- BB** Standard methods for the examination of water and wastewater . - 21st ed Washington : American Public Health Association : American Water Works Association : Water Environment Federation, 2005

The updated recommended bibliography can be consulted in:

<http://psfunizar7.unizar.es/br13/egAsignaturas.php?codigo=25224&Identificador=C70913>